Undergraduate Honors Thesis

An Evaluation of Respiratory Therapist-Delivered COPD Self-Management Education and Hospital Readmissions

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Abstract

BACKGROUND: Chronic Obstructive Pulmonary Disease (COPD) is the third leading cause of death in USA, known to annually cause 134,676 American deaths. In 2011, it was estimated that 12.7 million adults were living with COPD and there are over 800,000 COPD-related hospital admissions in the USA annually. The increase in prevalence of COPD, and the severity of the disease, highlights the need for intervention in COPD treatment with a focus on prevention of exacerbations and self-management. Current research illustrates a number of ways to effectively manage COPD disease progression including: use of the GOLD guidelines to classify and treat COPD, medication, smoking cessation, and proper self-management of disease. However, there is very little research exploring the impact of healthcare provider-delivered, comprehensive patient education and smoking cessation counseling to improve self-management of COPD and contribute to the prevention of hospital readmissions. **PURPOSE:** The purpose of this study was to determine the perceived benefits and potential reduction of hospital readmission following COPD disease self-management education and smoking cessation counselling facilitated by trained Respiratory Therapists (RT). **METHODS:** A retrospective chart review of the first 10 months of an RT-delivered COPD education service with COPD patients on a specific service at The Wexner Medical Center was conducted. RTs administered patient education and recorded an assessment and evaluation in the electronic health record regarding the education session. A COPD assessment test (CAT) was also administered together with initial assessment of the patient by respiratory therapist. After collection of initial assessment data and delivery of the CAT instrument, patients were seen for follow-up by an RT and received tailored COPD education. Following the education session, patients were seen again once or twice more before they were discharged. The group of COPD patients who were not seen by the RT for patient education was also examined **Results:** Eighty three out of 204 (40.7%) patients with primary or secondary diagnosis of COPD received COPD education by Respiratory Therapists. These patients also had an average of over 2 hospitalizations in the past year, average smoking history of 39.3 pack years and over 3 additional comorbidities at the time of hospitalization. Greater than 85% of admitted patients with COPD diagnosis, who self-identified as current smokers, did not receive NRT. The percentage of respiratory related readmissions for patients seen by respiratory therapists and not seen by respiratory therapists was 10.8% and 11.6% respectively. The number of patients who received pulmonary rehabilitation prior to admission was 10 (12%). **Conclusion:** COPD education provided by an RT is a valuable intervention to managing COPD patients' disease progression. RTs can play a larger role by contributing more to the COPD management program including smoking cessation programs and pulmonary rehabilitation information/counseling as part of the COPD education. RTs can also be placed at transitional care to provide more long term management of patients with COPD. Medication management should include tailored medication based on individual patients' GOLD classification and should be a critical part of the COPD education provided by RTs.

Chapter 1: Introduction

Statistics show that in 2010, Chronic Obstructive Pulmonary Disease (COPD) was the third leading cause of death in USA with 134,676 Americans dying from COPD.[1] In 2008, there were 822,500 COPD-related hospital admissions in USA.[24] In 2011, it was estimated that 12.7 million adults were living with COPD.[2] The increase in prevalence of COPD, together with the severity of the disease, highlights the need for immediate intervention in COPD treatment and a focus on preventive and maintenance measures.

Patients with COPD have great effect on the healthcare system, especially in terms of readmission rates as well as the amount of emergency department (ED) visits in hospitals. In 2008, one in five admissions for COPD resulted in readmission within 30 days.[17] On average, readmissions for COPD as the principal diagnosis cost 18 percent more than for an initial admission for COPD ($8,400 vs $7,100).[17] Studies have shown that 46.3% of COPD-related ED visits resulted in immediate hospital admission.[3] This represents an increasing burden to the healthcare costs in the United States.

In addition, COPD also has a negative impact on the individual in terms of quality of life and psychological aspects. Studies have shown that higher morbidity, decreased quality of life, poor compliance to treatments and low self-esteem are characteristics commonly found in individuals who are chronically ill.[4] Even in younger subjects with mild COPD, significant psychological impairment has been noted.[5] Several studies have also found that due to the increased work of breathing in individuals with COPD, together with poor nutritional status due to breathlessness from eating, will lead to a

reduction in respiratory muscle and systemic muscle strength which affects an individual's endurance and participation in social activities.[4,6,7]

Based on current research, much can be done to manage the disease progression of COPD in patients as well as to prevent hospital readmissions through the facilitation of proper disease self- management. Current research illustrates a number of ways to effectively manage COPD disease progression as well as to treat COPD. This includes: the use of the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines to classify and treat COPD, medications, smoking cessation counseling, and self-management skills to enhance management of the disease. Current GOLD guidelines categorize COPD into 4 stages based on the severity of the disease. GOLD classification 1 is considered mild COPD and GOLD classification 4 is considered severe COPD.[8] This categorization is based on the patients' symptoms, degree of airflow limitation, risk of exacerbations and comorbidities.[8] Depending on the stage classification of COPD, individuals are prescribed different medications for treatment. Medications have been found to be useful in managing the course of the disease as well.[9,10] Medications range from short-acting anticholinergic or short-acting beta2-agonists as needed for individuals with mild COPD to the use of long-acting beta2-agonist/anticholinergic with corticosteroids for individuals with severe COPD.[8]

Studies have also shown that smoking cessation counseling is also an important intervention that reduces the progression of the disease as well as decreases total mortality rate in COPD patients.[11] Current research suggests that patients with chronic diseases like COPD equipped with effective self-management skills have better self-

care and patients themselves play a critical role in determining the course of their disease through proper medication usage, self-measurements and exercise.[12]

As seen above, there is evidence that the different approaches used to manage COPD have a positive impact on disease management. However, there is very little research demonstrating the impact of healthcare provider delivered, comprehensive patient education which includes knowledge of self-management as well as smoking cessation counseling to improve patients' self-management of the disease. Since respiratory therapists (RT) are knowledgeable about nicotine replacement therapy (NRT) and are often in contact with patients for COPD treatment due to breathing issues, respiratory therapists are have the opportunity to use counselling strategies and to contribute to facilitation of smoking cessation.

An evaluation of RT administered COPD education will enhance COPD patients' care by illustrating the how important RTs' role is in educating COPD patients. Research in this area will also demonstrate the usefulness of RT-provided self-management education to the management of COPD inpatients.

This project is designed to determine the perceived benefits of COPD education and to evaluate COPD patients' hospital readmission rate following COPD disease self-management education facilitated by trained RTs. The research questions addressed in this study include:

1) What are the patients' perceived benefits following smoking cessation counselling and COPD management education delivered by RTs during an inpatient stay?

2) What is the frequency of readmission and reasons for readmission in COPD patients that did and did not receive disease management education delivered by the RT?

Chapter 2: Literature Review

A literature review was conducted via a search on Pubmed/MEDLINE from 2004 to 2014 using the key words: COPD, counselling, smoking cessation, inpatient, disease management, pulmonary rehabilitation.

Smoking Cessation

The study 'Clinical trial comparing nicotine replacement therapy plus brief counselling, brief counselling alone and minimal intervention on smoking cessation in hospital inpatients' aimed to determine whether brief cessation counselling intervention or counselling with nicotine replacement therapy (NRT) was more effective in patients' attempt to quit smoking.[13] Medical and surgical inpatients who were current smokers at the time of admission were randomized to receive either usual care (smoking status recorded but no intervention done), counselling alone (20 minutes of counselling by trained nurse/physician) and counselling plus 6 weeks of NRT).[13] Results show that at discharge, subjects who received NRT plus counselling had the highest rate of abstinence (55%) as compared to counselling alone (43%) and usual care (37%).[13] No significant difference between usual care and counselling alone was noted.[13] The research concluded NRT given together with brief counselling to hospital inpatients is an effective smoking cessation intervention.[13] This study illustrates the importance to incorporate counselling with NRT to increase rates of abstinence from smoking. Healthcare staff who have interactions with patients should be trained to counsel patients taking NRT so that rates of abstinence may increase. Since respiratory therapists already have the knowledge about NRT and are often in contact with patients

for COPD treatment, respiratory therapists are in good position to learn counselling and contribute to smoking cessation for patients.

The systematic review 'Smoking cessation interventions for hospitalized smokers' reviewed the evidence on the effectiveness of smoking cessation interventions for hospitalized patients.[14] This review concluded that smoking cessation counselling together with supportive contact of more than a month after discharge was beneficial.[14] Thirty three studies were included in this systematic review. Counselling was found to be effective when offered to all hospitalized smokers (increase the odds of smoking cessation by 65%).[14] Addition of NRT to counselling resulted in a 47% increase in chances of quitting as compared to placebo or no drug.[14] Subsequent supportive contact for over 1 month after discharge increases the odds of smoking cessation by 65% over what is achieved by hospitalization without subsequent contact alone.[14] This study also illustrates the importance of counselling added with NRT as an effective smoking cessation strategy. Follow-up sessions should be considered after counselling session with NRT. There were no studies that described RT delivered interventions. Respiratory therapists are in good position to provide smoking cessation counselling perhaps with the addition of a follow-up session.

The study 'Successful smoking cessation in COPD association with comorbidities and mortality' reported the factors that increase the risk of failure in smoking cessation among COPD patients and to find out if smoking cessation had any effect on mortality.[15] Inpatients and outpatients who had visited the pulmonary clinic in 1995 to 2006 were

found via hospital registries.[15] Comprehensive medical histories were collected and participants agreed to continue their follow-up through questionnaires for the next 10 years.[15] Patients were diagnosed with COPD via clinical outcome, smoking history of 10 or more years and spirometry verification of airway obstruction.[15] Results show that alcohol abuse and psychiatric conditions were the most significant risk factors associated with smoking cessation failure.[15] Mortality rate was also significantly higher among those who smoke (20.7%) as compared to those who quit (12.2%).[15] Study results concluded that alcohol abuse and psychiatric conditions significantly decreases the chance of success in those who wanted to quit smoking.[15] Smoking cessation reduces mortality rates. Hence, smoking cessation is very important in COPD patients. It might be useful to consider COPD patients' smoking history together with information related to alcohol abuse and other psychiatric disorders.

The systematic review 'Improved patient outcome with smoking cessation: when is it too late?' examined the relationship between cigarette smoking to COPD, lung cancer and cardiovascular disease and also studied the impact of tobacco in patients with COPD, lung cancer and cardiovascular disease.[16] Data suggests that 50% of smokers will eventually develop COPD.[16] Smoking cessation is a proven way of slowing down the disease progression of COPD.[16] In the Lung Health Study, quitting smoking was associated with slower decline in lung function and a reduction in hospitalization as well as total mortality.[16] A 32% reduction in all-cause mortality was noted with successful smoking cessation.[16] The use of pharmacotherapy was also found to be better than non-pharmacotherapy approaches in effecting complete abstinence rate.[16] This study

concludes that smoking cessation is beneficial for individuals with COPD and in severe cases of COPD, and reduces total mortality rate.[16] Again, we see here the importance of smoking cessation in helping to reduce disease progression of COPD. Smoking cessation is essential and should be implemented as part of the COPD management plan.

The systematic review 'Smoking cessation for patients with COPD: An evidence based analysis' evaluated the effectiveness of smoking cessation in patients with COPD as compared to usual care.[18] This literature review included a search with inclusion criteria: 1950 to 2010 full reports, proven diagnosis of COPD, patients more than 18 years old, 6 or more months of abstinence as an outcome and patients followed-up for at least 6 months or more.[18] The review illustrates that the average 12-month abstinence rates were: 1.4% for usual care, 2.6% for minimal counselling, 6% for intensive counselling and 12.3% for intensive counselling with pharmacotherapy.[18] Intensive counselling coupled with pharmacotherapy was the most effective approach resulting in the highest abstinence rate.[18] Abstinence rates are higher in COPD patients receiving intensive counselling with pharmacotherapy combined. Including intensive counselling together with NRT is a good strategy for smoking cessation.

Clinical Questionnaire

The study 'Role of clinical questionnaires in optimizing everyday care of chronic obstructive pulmonary disease' addressed the implications COPD has on patients' lives and developed new assessment tools for physicians to consistently measure the impact of COPD on patients in routine clinical practice via simple, standardized methods.[19]

Patients were identified by systematic screening of a national sample of 26,880 U.S households.[19] Patients selected for the study were 45 years old or more in age and have been diagnosed with COPD, emphysema or chronic bronchitis.[19] Results demonstrated that 90% of individuals with COPD experienced symptoms most of the days if not every day during a certain period of the year.[19] Studies also demonstrated that patients have difficulty in rating their disease severity.[19] The COPD assessment test (CAT) is a short 8 item questionnaire designed to be completed by patients for routine use in clinical practice.[19] The CAT provides a holistic measurement of COPD health status.[19] The author's previous study developed and validated CAT.[20] A reliable, standardized measurement of the overall disease impact helped to optimize patient care for patients with COPD.[19] Incorporation of questionnaires such as CAT enabled improved shared decision making between patients and physicians, leading to effective management of COPD patients.[19] This study illustrates a need to develop and incorporate a standardized COPD questionnaire into patient care, to better understand the patients' disease severity leading to more effective management. Patient education on COPD is also needed so that people are more aware of what this disease is about and its treatment. Respiratory therapists can make use of the time while giving COPD treatments to educate patients as well as to have patients fill out a standardized questionnaire. Answers filled out on the questionnaire, together with clinical measurements, can also be used to consider changes needed in the COPD treatment given to patients.

Pulmonary Rehabilitation

The study 'Four weeks' intensive rehabilitation generates significant health effects in COPD patients' investigated if participation in a four week, intensive, multidisciplinary, in-patient pulmonary rehabilitation (PR) program will create changes in World Health Organization's International classification of functioning, disability and health (ICF) body functions and activities, and participation components.[21] The second purpose of the study was to find any association between changes during PR in the two ICF components.[21] Further, the third aim of the study is determine if there are gender differences in the response to PR.[21] COPD patients, who are non-smokers, and live within 6 hours of travel from the clinic were included.[21] Excluded participants include: those who were in training twice a week or more or had PR in the last year, patients with exercise limiting cardiovascular musculoskeletal disease, and those on long term oxygen therapy.[21] For the 40 participants, results demonstrated that after PR, participants had improved muscle strength, work rate peak (WRpeak) and dyspnea at 70% WRpeak.[21] The effects of exercise among COPD patients by the program duration, training frequency and intensity.[21] Walking capacity (TET, threadmill endurance time) was nearly doubled after PR.[21] Significant improvements in health related quality of life (HRQoL) was also noted with 93% increase in treadmill endurance time, 6% increase in peak oxygen uptake and 6% and 15% increase in arm and leg maximal voluntary contraction respectively.[21] Clinically important improvements in HRQoL were found in two out of three men and one in three.[21] Four weeks of intensive PR resulted in more significant health effects as compared to longer lasting programs.[21] Short, intensive, inpatient PR is beneficial to COPD patients resulting in positive health effects.[21] This

study demonstrated that pulmonary rehabilitation is an important aspect that can improve COPD patients' health related quality of life which may result in an improvement in the readmission rate of these patients. To address this recommendation, a four week intensive PR program may be included in a COPD self-management program.

Inpatient Management of COPD

In the study 'Implementing evidence based-guidelines: inpatient management of chronic obstructive pulmonary disease', concordance with evidence based guidelines for inpatient management of COPD was examined and deficiencies in compliance with guidelines by feedback of audit results and distribution of an education packages were addressed.[22] Patients admitted via the emergency department (ED) for exacerbation of COPD were included in this study.[22] This study included 84 subjects. Recommendations from guidelines supported by Level A evidence were used in this study, which include: NIPPV, Bronchodilators, antibiotics, IV aminophylline, steroid initiation, steroid duration, pulmonary rehab and long term oxygen therapy.[22] Forty nine consecutive COPD admissions were reviewed and presented to medical staff.[22] After the presentation, education packages were distributed which consisted of a printed summary of the audit results, a referral form for pulmonary rehabilitation with an explanatory pamphlet and pocket-sized laminated guidelines.[22] Concordance rates of initiation of systemic steroids and avoidance of intravenous aminophylline were 83% and 100% respectively.[22] Other concordance rates were less than 60% (Harvey). The only significant post intervention improvement was for steroid duration (10% vs 29%).[22] In conclusion, recommendations

for steroid initiation and avoidance of aminophylline are followed well by physicians.[22] The intervention done in the study significantly improved the adherence with recommendations for steroid duration.[22] Other recommendations were however less adhered to by physicians.[22] From this study, we can see that although there are researches recommending good guidelines to manage COPD patients, concordance rates to these recommendations were generally poor. Perhaps defining a clear protocol for managing COPD patients as well as education to healthcare staff on COPD management is essential. In this study, the interventions were delivered by physicians or junior doctors. Respiratory therapists can also play an important role in providing education to other healthcare professionals who are involved in COPD patients' care.

The study 'Disease management program for Chronic Obstructive Pulmonary Disease' determined if a simplified disease management program reduces hospital readmission and emergency department (ED) visits because of COPD exacerbation.[23] Seven hundred and forty three patients with severe COPD were selected and randomized into disease management group or usual care group.[23] The Disease management group received 1 to 1.5 hour education session, an action-plan for self-treatment in event of exacerbation and monthly follow-up calls.[23] Patients in the usual care group received one-page handout containing principles of COPD care and a 24 hour nursing helpline.[23] Results show that the mean cumulative frequency of COPD related hospitalizations and ED visits was 0.82 and 0.48 per patient in usual care and disease management group respectively.[23] Hospitalization due to cardiac or pulmonary problems other than COPD was reduced by 49%.[23] This study concluded that disease management program helps to reduce hospitalizations and ED visits in COPD

patients.[23] Hence disease management is very important especially in preventing readmission of COPD patients.

Conclusion

From the literature review, we can conclude that smoking cessation is an important strategy that should be included in the patient care plan of COPD patients. The most effective way to achieve smoking cessation is through NRT coupled with counselling. Healthcare staffs that have interactions with patients should be trained to counsel patients taking NRT so that rates of abstinence will increase. Follow-up sessions should be considered after counselling sessions with NRT.

Pulmonary rehabilitation is also an important aspect that can improve COPD patients' health related quality of life which may result in an improvement in the readmission rate of these patients. A four week intensive PR program can be included into a COPD self-management program.

Defining a standardized intervention for managing COPD patients as well as education to healthcare staff on COPD management is essential. Disease management which includes patient education on COPD as well as an action-plan for self-treatment is very important and results in reduced readmission rates of COPD patients.

Since respiratory therapists already have the knowledge on NRT and are often in contact with patients for COPD treatment, respiratory therapists are in good position to learn counselling strategies and to contribute facilitation of smoking cessation.

Chapter 3: Methods

This was a descriptive study utilizing a retrospective chart review of COPD education interventions provided by a RT. This study also intended to include the collection of a descriptive survey via an interview questionnaire which would have been conducted by the researcher through phone to patients, following discharge. The purpose of this study was to determine the perceived benefits and potential reduction of hospital readmission following COPD disease self-management education and smoking cessation counselling facilitated by trained Respiratory Therapists. The research questions addressed in this study were:

1. What were the patients' perceived benefits following smoking cessation counselling and COPD management education delivered by RTs during an inpatient stay?
2. What was the frequency of readmission and reasons for readmission in COPD patients that did and did not receive disease management education delivered by the respiratory therapist?

Retrospective Chart Review

A retrospective chart review from May 2014 to February 2015 of the medical records of patients admitted to the MED4 service of The Ohio State University Wexner Medical Center (OSUWMC) with a primary or secondary diagnosis of COPD was conducted. A data collection sheet was used to record data points (APPENDIX A) from the electronic medical record. Data collected in the data

collection sheet (APPENDIX A) included readmission rates after COPD self-management education was conducted, reason for readmission and other data points that were important to further describe the patients with COPD. The chart review focused on disease self-management COPD education provided by respiratory therapists and hospital readmissions. The additional data collection items were collected to describe the population. Data was collected from COPD patients admitted in OSUWMC from May 2014 to February 2015.

RT Delivered COPD Self-Management Education

The RTs from the Patient Education and Evaluation Program (PEEP) team administered patient education and completed an assessment and evaluation in the medical record. The 12 trained PEEP team members have completed 4 hours of COPD self-management education. Due to workload limitations and availability of the COPD patients, not all eligible patients were seen by the RTs. The group of COPD patients who were not seen by RTs for patient education were also examined. It is estimated that there were about 5 COPD patients seen per month. A number of patients were not seen due to availability and workload of the RT department on any given day. PEEP team members were frequently reassigned to assist other critical care departments that needed help.

A COPD assessment test (CAT) was administered together with initial assessment of the patient’s past medical history and history of present illness by the respiratory therapist. The CAT is a subjective test that measures severity of patients' COPD

symptoms. After collection of initial assessment and CAT, the RT did a follow-up with patients and gave tailored COPD self-management education. Education sessions included COPD management strategies including three big topic areas (About COPD, Your Lungs and Medicines) as well as smoking cessation. Notes regarding the education sessions were recorded in medical record (IHIS). Following the education session, patients were seen again once or twice prior to hospital discharge. Medical Records of subjects were reviewed and hospital readmissions were recorded. An interview questionnaire was intended to be conducted by phone following discharge to evaluate the patient perceptions about this service (Appendix B).

Follow-up Interview

For patients who received COPD self-management education, a descriptive survey was intended to be conducted by phone interview 30 days following discharge to evaluate the patient perceptions about this service (Appendix B). Interview questions are included in Appendix B.

Data Analysis Method

To address Research Question 1: "What are the patients' perceived benefits following smoking cessation counselling and COPD management education delivered by RTs during an inpatient stay?" the collection of the phone interview surveys were planned to be analyzed via descriptive statistics.

However, due to time constraints, the phone interview to address Research Question 1 was not addressed. After the research proposal was approved from the Honors Committee, an IRB application was submitted on November 25, 2014. The IRB

granted final approval for the study on March 24, 2015. The researcher's access to the medical record system (IHIS) was deactivated at this point, thus a request for approval and access into the electronic medical record system (IHIS) was sent to the OSU Medical Information Management department (Privacy Committee). Final approval was received on June 16, 2015. Because the follow-up interview phone call was to be done 30 days after patients' discharge and the researcher had to leave the country in August, there was not enough time to complete this part of the study. No surveys were conducted and analysis were not done to address Research Question 1.

To address Research Question 2: "What is the frequency of readmission and reasons for readmission in COPD patients that did and did not receive disease management education delivered by the respiratory therapist?" the retrospective chart review of the medical records of patients from data collection sheet were used to record data points (APPENDIX A) from the electronic medical record. A descriptive analysis was conducted to include the mean and median of readmission rates in COPD patients that did and did not receive disease management education delivered by the respiratory therapist. Other data collected in the data collection sheet (APPENDIX A) were examined to further describe the sample.

Chapter 4: Results

Demographics of Patients Seen by Respiratory Therapists

Eighty three out of 204 (40.7%) patients with diagnosis of COPD received COPD education by Respiratory Therapists at OSUWMC. The mean age of patients seen by Respiratory Therapists (RTs) was 63 years old. Seventy two percent (72%) of the patients who received COPD education were White. Forty five percent (46%) were males and 54% were females. Demographics of patients seen by RTs in Table 1.

Demographics of Patients NOT Seen by Respiratory Therapists

One Hundred and twenty one out of 204 (59.3%) patients did not receive COPD education by RTs at OSUWMC. The mean age of patients not seen by Respiratory Therapists (RTs) was 63 years old. Seventy four percent (74%) of the patients who did not received COPD education were White. Forty eight percent (48%) were males and 52% were females. Demographics of patients not seen by RTs in Table 1.

Demographics of patients	**Patients seen by RTs (n = 83)**	**Patients not seen by RTs (n= 121)**
Mean age (years old)	63	63
Race: White	60 (72%)	90 (74%)
Males	38 (46%)	58 (48%)
Females	45 (54%)	63 (52%)

Table 1: Demographics of patients seen and not seen by RTs

Health Status of Patients who received COPD Education

The patient population who received COPD education by Respiratory Therapists had an average smoking history of 39.3 pack years. These patients also had an average of almost 3 hospitalizations in the past year and over 3 additional comorbidities at the time of hospitalization. Forty seven percent of patients were on home oxygen from a range of 1.5 liters per minute (lpm) nasal cannula to 6 lpm nasal cannula. The number of patients who received pulmonary rehabilitation prior to admission was 10 (12%). In contrast, the health status of patients seen and not seen by RTs are included in Table 2. Patients with a clear chest x-ray on chest X-ray report were 20.7%, while 48.8% of these patients had opacities or bilateral pleural effusions (Table 3). The chest x-ray were the most recent chest x-rays taken at the time patients received COPD education by RTs.

Health Status:	**Patients Seen By RTs (n = 83)**	**Patients Not Seen By RTs (n = 121)**
Mean Smoking History (Pack Years)	39.3	35.2
Mean Hospitalizations in past year	2.76	2.82
Mean Comorbidities per patient at time of admission	3.59	4.07
Percentage of patients on home oxygen	47%	40%
Range of home oxygen concentration	1.5 to 6 liters per minute (lpm)	2 liters to 8 liters per minute (lpm)
Number of patients who receive Pulmonary Rehabilitation prior to admission (Percentage)	10 (12%)	16 (13.2%)

Table 2: Health Status of Patients who received COPD Education and Patients who did not receive COPD Education.

Chest X-Ray	Number of patients who were seen by RTs (Percentage)(n = 83) (1 patient's CXR missing)	Number of patients who were not seen by RTs (Percentage) (n = 121) (3 patient's CXR missing)
Clear	17 (20.7%)	29 (24.6%)
Mild atelectasis	9 (11.0%)	13 (11.0%)
Opacities in one lung	12 (14.6%)	17 (14.4%)
Opacities in both lungs / Pleural Effusion	40 (48.8%)	49 (41.5%)
Mass/ calcified granulomas	4 (4.9%)	10 (8.5%)

Table 3: Percentage breakdown of Chest X-Ray Findings in Patients who received COPD Education and Patients who did not receive COPD Education. Four patient's Chest X-Ray was not found in the medical record charts.

COPD Education Sessions

The patient's hospitalization respiratory medications were compared with their home medication regimen and categorized into three categories: 1) respiratory medications administered were less comprehensive than home medications 2) respiratory medications administered were similar to home medications 3) respiratory medications administered were more comprehensive than home medications. The percentage of patients in Category (1), (2) and (3) were 8.4%, 51.8% and 39.8% respectively (Table 4). A total of only 6 out of 83 patients (7.2%) had their education level recorded in the chart. There were not consistent scores for Pre and Post CAT scores. Only 18 patients had both values. Handouts were delivered to 95% of the patients seen by a Respiratory Therapist. Out of the patients seen by RTs (n= 83), 32.4% received Nicotine Replacement Therapy (NRT) and 67.6% did not receive NRT (Table 5). Total number of current smokers is 76 out of 204 COPD patients. Greater than 85% of all admitted patients with COPD diagnosis (n= 204), who are current smokers, did not receive NRT.

Thirty four patients out of 83 who were seen by RTs were current smokers. Forty two patients out of 121 patients who were not seen by RTs were current smokers.

Comparison of Respiratory Medications Administered	Number of patients (Percentage)
Category 1 (less comprehensive)	7 (8.4%)
Category 2 (same or similar)	43 (51.8%)
Category 3 (more comprehensive)	33 (39.8%)

Table 4: Percentages of patients' Hospital Respiratory Medications compared to their Home Medications (Patients who were seen by RTs) (n = 83)

	Patients seen by RTs (n = 83)	Patients not seen by RTs (n = 121)
Number of current smokers who received NRT (percentage)	11 (32.4%)	0
Number of current smokers who did not receive NRT (percentage)	23 (67.6%)	42
Total number of current smokers	34	42

Table 5: NRT delivery by respiratory therapist for current smokers.

30 Days Readmission Rate

The overall readmission rate (at 30 days post discharge) of patients seen by RTs and readmission rate of patients who were not seen by respiratory therapists were both 18% (Table 6). The percentage of respiratory related readmissions for patients seen by RTs and respiratory related readmissions for patients not seen by respiratory therapists is 10.8% and 11.6% respectively (Table 6). Respiratory related readmissions included COPD exacerbation, bronchitis with acute bronchospasm, respiratory distress, shortness of breath and chest pain.

	Patients seen by respiratory therapists (n = 83)	**Patients not seen by respiratory therapists (n = 121)**
Number of Respiratory Related Readmission (percentage)	9 (10.8%)	14 (11.6%)
Number of non-respiratory related readmission (percentage)	6 (7.2%)	8 (6.6%)
Total number of patients readmitted (percentage)	15 (18%)	22 (18.2%)

Table 6: Comparison of Readmission rate between patients who were seen and patients who were not seen by Respiratory Therapists.

Chapter 5: Discussion

In this study, the rate of respiratory related readmissions observed in patients who were seen by RTs was 0.8% less than in patients who were not seen. Over 48% of patients who were seen by RTs had opacities in both lungs and/or pleural effusion. This reduction in respiratory related readmission rate may indicate the potential benefits of COPD Education given by RTs. It has been previously illustrated that COPD education may improve patients' self-control and self-management of the disease, hence reducing morbidity.[25] Improvement in self-management of the disease could be a factor that led to the decrease in readmission rates. This could suggest that COPD education is a valuable intervention to COPD patients. It is unfortunate that the researcher could not conduct the inquiry for follow-up to further illustrate the benefits of the service.

The percentage of admitted patients who were current smokers, receiving NRT was only 14.5%. This may demonstrate a missed opportunity and the Respiratory Therapists could have contributed to providing tobacco dependence treatment to these 85.5% of patients who did not receive NRT. Some possible reasons for patients not receiving smoking cessation program include patient's preference not to receive NRT, contraindications with current medications or poor patient health status to receive NRT. Smoking cessation is a evidence-based strategy to decrease the disease progression of COPD.[16] During the period of hospitalization, patients are prohibited from smoking. This period of forced abstinence is an optimal period for RTs to provide tobacco dependence treatment as patients who are forced to abstain from smoking will start experiencing tobacco withdrawal symptoms. It has been previously illustrated that the use of NRT

helps alleviate discomfort caused by the forced abstinence.[26] Positive experience from the use of NRT is also likely to result in continued use for tobacco cessation.[26] Hence, smoking cessation should be incorporated as an essential part of the COPD education administered by RTs.

Medication management is also an important key in respiratory therapist administered COPD education. Results in this study show that 40% of patients who received COPD education by respiratory therapists, received a more comprehensive set of medications during hospitalization than their home medications. The more comprehensive set of medications that patients who were seen by RTs received during hospitalization, were based on the GOLD guidelines. Medication management of COPD patients based on the GOLD guidelines may improve COPD symptoms and delay lung function decline.[27] RTs should also recommend changes to medication regimen if needed, to improve patient's condition at home.

The results of this study show that only 12% of COPD patients who were seen by respiratory therapists had previously participated in pulmonary rehabilitation. Pulmonary rehabilitation is also an important aspect that can improve COPD patients' health related quality of life which may result in an improvement in decreasing the readmission rate of these patients.[21] Referrals are often done if patients were seen by RTs for COPD education, however many patients often fail to attend pulmonary rehabilitation sessions. Respiratory therapists can play a larger role by including education about the benefits of pulmonary rehabilitation as part of the COPD education provided.

In this study, the education provided to patients were mostly done only once or twice during the COPD patient's hospitalization period. This is a short term solution in

hopes that these patients will not be readmitted within 30 days. However, RTs can contribute more to the education and disease management of COPD patients. Studies have shown that respiratory care treatment directed by RT is equally effective as compared to physician directed care.[28] RTs can be placed at specialized outpatient clinics or transitional clinics for COPD patients to educate patients on self-management strategies and proper use of medication and respiratory devices on a more long term basis with follow-up sessions whenever needed. RTs can also be responsible for reviewing COPD patient's medication based on GOLD guidelines and provide adjustments to medication as needed. RTs at the bedside can contribute by providing information and education needed for COPD patients to successfully self-manage the disease.

The COPD education by RTs are in place so that patients can properly self-manage their disease and hopefully reducing the need for urgent critical care. Prevention is important as with any disease. Potential COPD patients often undergo pulmonary function tests to confirm that they are having COPD. RTs can provide education and self-management strategies to these patients right upon confirmed diagnosis of COPD. This strategy may lower the number of COPD patients requiring urgent critical care due to exacerbations which resulted from the lack of knowledge about their disease or improper medication usage and respiratory devices' techniques.

Limitations of this study include the time constraints which led to the incompletion of a part of this study. The long process for the IRB approval followed by approval of electronic medical records (IHIS) access led to a 7 months delay in data collection. Another limitation of this study was the availability of respiratory therapists to provide

COPD education to patients. Respiratory therapists that are part of the PEEP team were frequently reassigned to assist other respiratory therapists in acute patient care. This led to only 40.7% of eligible patients to receive COPD education. The incomplete data found in IHIS is also a limitation of this study. Some of the notes recorded in IHIS were incomplete and thus some information was not available (like the CAT scores).

Unfortunately due to time constraints, the patients' perceived benefits of COPD education was not evaluated. Further studies should be conducted to evaluate the patients' perceived effectiveness of COPD education provided by RTs using the phone interview questions (APPENDIX B).

Conclusion

In conclusion, COPD education provided by Respiratory therapist is a valuable intervention to manage COPD patient's disease progression. There are more opportunities to improve the COPD management program. Studies have shown that respiratory care treatment directed by RT is as effective as physician directed care.[28] Respiratory therapists can play a larger role by contributing more to the COPD management program including smoking cessation programs and pulmonary rehabilitation information/counseling as part of the COPD education. RTs can also be placed at transitional care to provide a more long term management of the patients with COPD. The period of forced abstinence during patient's hospitalization is an optimal period to provide tobacco dependence treatment as patients who are forced to abstain from smoking will start experiencing tobacco withdrawal symptoms. The use of NRT helps alleviate discomfort caused by the forced abstinence and promotes continued usage of NRT even after hospitalization. Medication management should include tailored medication based on individual patients' GOLD classification and be an active part of the COPD education provided by RTs.

Appendix A: Data Collection Sheet

ID #	COPD Ed?	Age	Sex	Race	Smoker (Y/N)	Pack Years	Vaccination History (Flu/Pneumonia)	Pre-admission COPD Medication	Hospital COPD Medication	NRT	# Hospitalizations in last year	Comorbidities	Home Oxygen (Y/N)	Home Oxygen LPM	Current Hospital Oxygen (Y/N)	Current Hospital Oxygen LPM
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
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22																
23																
24																

Appendix A: Data Collection Sheet

ID #	Respiratory Meds	Education Level	COPD Education (Y/N)	Pulmonary Rehab in Past (Y/N)	Length of Pulm. Rehab (Months)	CXR	CAT Score (Pre)	CAT Score (Post)	Date Data Collected
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
21									
22									
23									
24									

Appendix A: Data Collection Sheet

Readmitted in 30 days? (Y/N)																								
Reason for readmission																								
Handouts Delivered																								

Appendix B: Phone Interview Script

Introduction – Good afternoon, my name is Riana Sim and I am an RT student conducting a research study which involves a short follow-up to the COPD education that you received at the OSU Wexner Medical Center by the Respiratory Therapist. At that time, you provided your contact information and consented to a follow-up to the meeting with the RT.

Do you have ten minutes to talk to me about that COPD education?

If no: when would be a better time to contact you? I will call you back at the time you suggested.

If yes: continue.

1) Do you remember talking to a Respiratory Therapist about your COPD? If no: thank you for your time. If yes: continue.

2) Was the information you discussed with the respiratory therapist more useful or less useful than information you received in the past?

If more useful: What specifically was more useful?

If less useful: What specifically was less useful?

3) Do you feel more confident or less confident about taking care of your COPD after meeting with the respiratory therapist?

If more confident: Specifically what are you more confident about?

If less confident: Specifically what are you less confident about?

4) Have you used the COPD book the RT gave you during the meeting?

If no: thank you for your time.

If yes:

a. How many times have you referred to the book?
b. What parts were most helpful to you?
c. What parts weren't as helpful to you?

Thank you so much for your time and your participation in this important research.

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